Annex 2

Social and Distributional Impacts Analysis

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Bath & North East Somerset, Bristol, North Somerset and South Gloucestershire Councils
working together to improve your local transport

North Fringe to Hengrove Package – Distributional Impact Appraisal Final Report

South Gloucestershire Council and Bristol City Council

November 2014

Plan Design Enable

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Document history

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Rev 2.0	Final Report	CM/LP/KQ/KC	KC	KC	RT	14th Nov 2014

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1. Introduction

1.1. Purpose of Report

This report presents findings from the Distributional Impacts (DIs) appraisal of the North Fringe to Hengrove Package (NFHP) to form part of the Full Approval Submission. The appraisal has been undertaken in accordance with WebTAG guidance, published by DfT in January 2014, which replaced Unit 3.17 (Guidance on Social and Distributional Impacts) with two separate units, Unit A4.1 (Social Impact Appraisal) and A4.2 (Distributional Impact Appraisal). Unit A4.2 is the guidance now used to undertake DIs appraisals.

1.2. Background – What is a DI appraisal?

DfT has developed its understanding of Distributional Impacts (DIs) through work over the last few years, including a detailed literature review of DIs in transport interventions, and consideration of current practice in appraisals.

'**Distributional**' impacts relate to the extent to which there are differences in the way impacts affect different groups in society. For example, the noise impacts of an intervention will affect different groups of households, with some experiencing increases, and others decreases. Depending on the geographical locations of different groups of people, these groups will each experience different impacts.

1.3. Overview of DI Process

The approach outlined in DfT's guidance ensures the DI appraisal is proportionate to the scale of the issue and follows a process to ascertain whether a full appraisal is required. Table 1-1 shows this process, detailing key decision-making points as illustrated by the three identified Steps.

Table 1-1 DI Process

Step	Description	Output
1	Screening Process: • Identification of likely impacts for each indicator.	Screening Proforma
2	Assessment: • Confirmation of the area impacted by the transport intervention (assessment area); • Identification of social groups in the assessment area; and • Identification of amenities in the assessment area.	DIs social groups statistics and amenities affected within the assessment area.
3	Appraisal of Impacts: • Core analysis of the impacts; and • Full appraisal of DIs and input into AST.	Appraisal worksheets and AST Inputs.

1.4. Scheme Overview

The North Fringe to Hengrove (NFHP) scheme is part of a programme of transport improvements planned for the West of England sub-region. The scheme comprises three MetroBus routes with sections of new and realigned highway. The Scheme will connect key employment hubs (Cribbs Causeway, Aztec West, Science Park at Emersons Green and Bristol city centre) with key residential areas in the north and south of the city (such as Bradley Stoke, Stoke Gifford, Emersons Green, Bedminster, Knowle West and Hengrove). New and improved facilities for pedestrians and cyclists will be provided alongside sections of the MetroBus network, making it easier and safer to

travel by foot or bike. The MetroBus plans include a significant redesign of Bristol city centre where large areas of the highway by the Cenotaph will be changed to pedestrian use and junctions will be remodelled to improve safety for pedestrians and cyclists.

The MetroBus network of services within the NFHP scheme would comprise the following three routes:

- Cribbs Causeway to Hengrove;
- Emersons Green to Hengrove; and
- Emersons Green to Bristol Parkway.

These MetroBus services will be fast, frequent and reliable with new, low-emission vehicles, high quality passenger facilities and interchanges, up-to-date passenger information and safe/secure access to stops. The weekday daytime frequencies for the three MetroBus services are assessed at six vehicles per hour on the Cribbs Causeway to Hengrove service and three vehicles per hour on the other two services.

A Programme Entry Major Scheme Business Case (MSBC) was submitted to the Department for Transport (DfT) by Bristol City Council and South Gloucestershire Council in March 2010. Following the completion of the Government's Comprehensive Spending Review in Autumn 2010, an Expression of Interest was submitted to the DfT in December 2010. The scheme was then included in the Development Pool of Local Major Transport Schemes, announced by the Minister in February 2011. Subsequently, the Best and Final Funding Bid for the scheme was submitted to the DfT in September 2011.

Funding approval and reconfirmation of Programme Entry for the Scheme was included within the Chancellor's Autumn Statement at the end of November 2011; this was confirmed by the DfT in December 2011.

Following the Best and Final Funding Bid, the scheme has been revised in Bristol City Centre as a result of a review of the scheme by Bristol City Council. The principal change was in the section between Prince Street and East Street/Dalby Avenue. In the BAFB, the route followed Prince Street, Prince Street Bridge, Wapping Road, a new bridge across the New Cut, St John's Road, and Lombard Street to East Street/Dalby Avenue. The revised scheme now runs along Prince Street, The Grove, Redcliffe Way, Redcliff Hill, Bedminster Parade and East Street to East Street/Dalby Avenue.

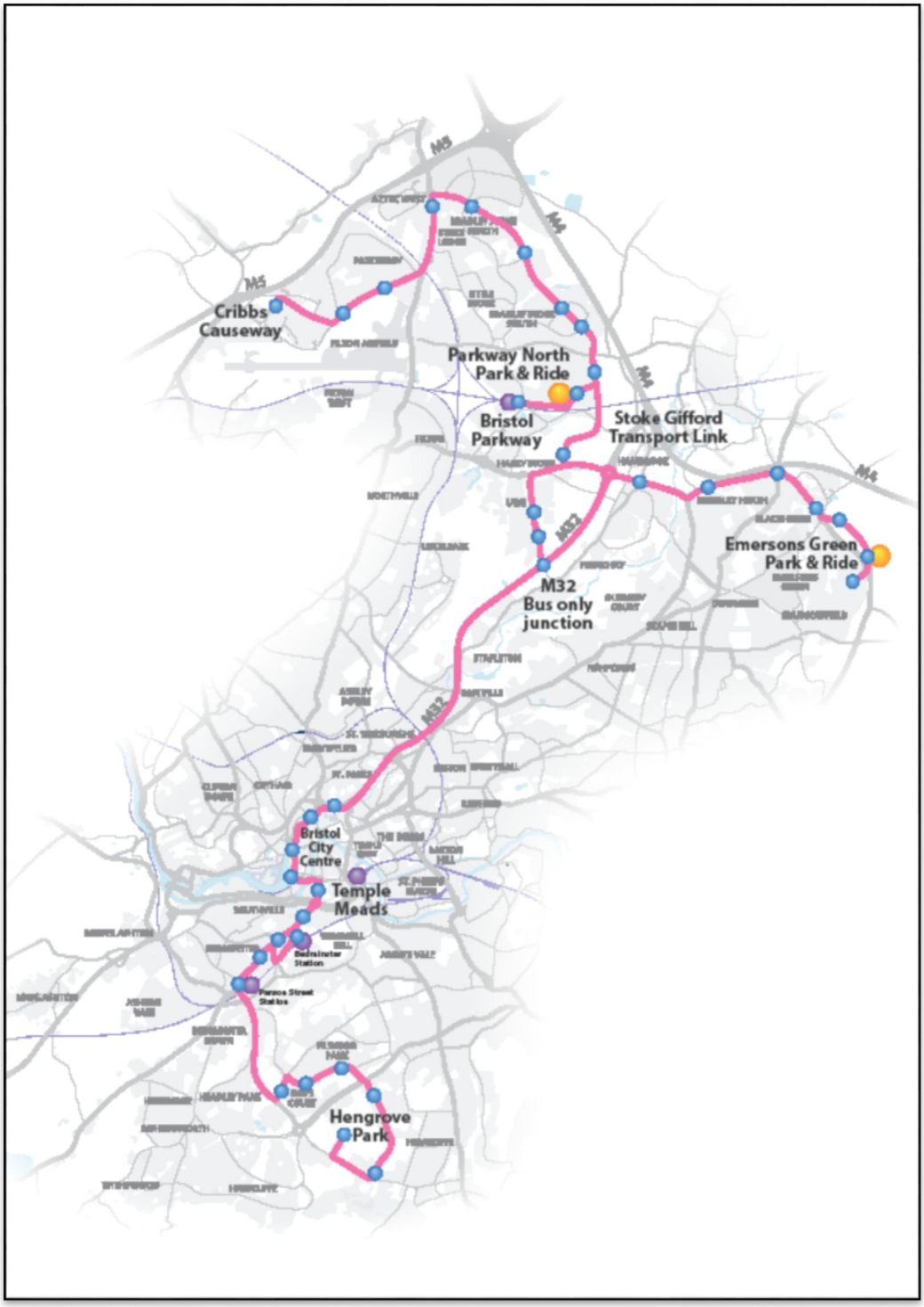
For the purpose of seeking planning permission, the overall NFHP scheme was divided into two elements:

- The Stoke Gifford Transport Link (SGTL); and
- The remainder of the NFHP scheme

The SGTL was given planning consent by South Gloucestershire Council in September 2013 and the remainder of NFHP was given planning consent by Bristol City Council on 27th August 2014 and by South Gloucestershire Council on 8th September 2014. Full Approval submission considers the overall scheme comprising SGTL and the rest of the NFH scheme.

The NFHP Scheme which forms the basis for the Full Approval submission and this Distributional Impact appraisal is shown in Figure 1-1.

Figure 1-1 NFHP Scheme



1.5. Scheme Objectives

The objectives of the scheme are:

- To support a buoyant economy, improve quality of life for sub-regional residents and improve local and national travel;
- To tackle congestion and therefore the economic, environmental and health damage that are associated with it;

- To encourage the shift to new forms of public transport and realise the associated environmental, climate change, safety and health benefits;
- To enhance the opportunities for regeneration and sustainable growth through the linking of areas of economic and housing expansion; and
- To promote equality of opportunity and security through improved connectivity to education, employment, leisure, health and retail facilities

1.6. Report Structure

Following on from this Introduction the remaining report is structured as follows:

- **Chapter 2: DI Appraisal – Screening** outlines the key findings of the Step 1 screening process;
- **Chapter 3: DI Assessment & Appraisal** (Steps 2 and 3) details the approach taken to assess each required DI indicator and the outputs from the appraisal; and
- **Chapter 4: Summary of Findings** describes the main outputs from the DI appraisal in a matrix and contains summary text to be included within an Appraisal Summary Table.

Appendix A presents the completed DfT Screening Proforma and Appendix B illustrates the socio-demographic profiling of the area local to the scheme with data from the 2011 Census[1].

[1] http://www.ons.gov.uk/ons/datasets-and-tables/index.html

2. DI Appraisal – Screening

2.1. Screening (Step 1) – Approach

The initial screening assessment considered the likely positive and negative impacts of the eight DI indicators on specific vulnerable groups, including children, older people, people with a disability, Black and Minority Ethnic (BME) communities, people without access to a car and people on low incomes.

A number of key questions are posed in a Screening Proforma published by DfT which are considered during the initial screening. The questions cover the following:

- Is the option being considered likely to have negative or positive impacts on specific groups of people, including children, older people, disabled people, Black and Minority Ethnic (BME) communities, people without access to a car and people on low incomes?
- Can the likely impacts be eliminated or mitigated through re-design or amendment?
- Are the impacts either significant or concentrated?

The remaining sections present the findings from the DI screening process and approach for the full appraisal (Steps 2 & 3) in accordance with WebTAG.

2.2. Screening (Step 1) – Key Findings

The findings from the screening are presented in the Proforma (see Appendix A) and are summarised in Table 2-1 below. The Proforma also contains recommendations, where appropriate, for further analysis through a full appraisal. Note that the Proforma completed for Step 1 was undertaken in 2011 and therefore the format differs slightly from the current version of the screening proforma.

Table 2-1 Summary of Proforma

Indicator	Likely DI Impact	Recommendations
User Benefits	Yes	Proceed to Steps 2 and 3
Noise	Yes	Proceed to Steps 2 and 3
Air Quality	Yes	Proceed to Steps 2 and 3
Accidents	Yes	Proceed to Steps 2 and 3
Security	Yes	Proceed to Steps 2 and 3
Severance	Yes	Proceed to Steps 2 and 3
Accessibility	Yes	Proceed to Steps 2 and 3
Affordability	No	No further assessment

2.3. Assessment (Steps 2) – Approach

Following on from the screening proforma (Step 1), the steps to complete the full DI appraisal, where required for each indicator are as follows.

2.3.1. Step 2a – Confirmation of impacted area by intervention

The screening provides a broad understanding of the areas likely to experience impacts as a result of the scheme. Within Step 2a, a more detailed examination is required to investigate the spatial impacts of the scheme. The area affected is likely to vary depending on the individual DI indicator being appraised.

2.3.2. Step 2b – Identification of the social groups in the assessment area

Step 2b requires the analysis of socio-economic and demographic characteristics to develop a profile of:

- The **transport users** that will experience changes in travel generalised costs resulting from the intervention;
- The **people living in those areas** identified as likely to be affected by the intervention; and
- The **people travelling in areas** identified as likely to be affected by the intervention.

The analysis uses a common dataset and plots the proportions of vulnerable groups within the impacted area for each indicator. Table 2-2 sets out the groups of people to be identified in the analysis for each indicator.

Table 2-2 - Scope of Socio-Demographic Analysis for DIs (Step 2b)

Social Group	User Benefits	Noise	Air quality	Accidents	Security	Severance	Accessibility	Affordability
Income Distribution	✓	✓	✓				✓	✓
Children: <16		✓	✓	✓	✓	✓	✓	
Young adults: aged 16-25				✓			✓	
Older people: aged 70+				✓	✓	✓	✓	
Population with a disability					✓	✓	✓	
Population of BME origin					✓		✓	
Households without access to a car						✓	✓	
Carers: households with dependent children							✓	

2.3.3. Step 2c – Identification of amenities in the assessment area

The concentration of social groups is not only based on resident population but also what trip attractors/amenities are within the assessment area. Using desktop analysis, the local amenities which are likely to be used by the identified social groups for each DI indicator are identified. Amenity data allows qualitative assessments / statements to be made to add value to the DI appraisal and provides a wider assessment than just that of the resident population.

The outputs of Step 2 are summarised and presented in order to provide evidence for the appraisal of impacts in Step 3.

2.4. Appraisal of Impacts (Step 3)

This step examines information collated in the previous steps to assess the potential impacts of the intervention on each indicator's social groups.

2.4.1. Step 3a – Core analysis of impacts

An assessment score will be given for each indicator and each of the social groups under consideration. The seven-point scoring system follows the standard DfT appraisal measures:

- Large beneficial;
- Moderate beneficial;
- Slight beneficial;
- Neutral;
- Slight adverse;
- Moderate adverse; or
- Large adverse.

2.4.2. Step 3b – Full appraisal of DIs

The analysis undertaken in Step 3a provides an assessment score for each indicator and each of the social groups under consideration. In addition, a qualitative assessment will be provided for each indicator to describe the key impacts in each case. These will be summarised in the DI appraisal matrix. The scores and qualitative assessment are summarised in the DI appraisal matrix of Social and/or Distributional Impacts with key findings presented in the 'key impacts' column.

3. DI Assessment & Appraisal

3.1. User Benefits Assessment

3.1.1. Introduction

In the majority of cases, there are user benefits associated with a transport intervention but these are generally net outcomes. Within the net outcome, some people may experience disbenefits for example through longer journey times or lower public transport service frequencies.

Step 1, screening process, identifies the likely broad assessment areas of the intervention and determines whether it needs to be appraised further, with Step 2a investigating these spatial impacts in more detail. Step 2b reviews the socio-demographic profile within the impact assessment area, while Step 2c identifies amenities in the assessment area of relevance. The outputs from Step 2 will feed into the core analysis of impacts (Step 3a) and the full appraisal of DIs (Step 3b).

3.1.2. Confirmation of impact assessment area (Step 2a)

The user benefit assessment area is defined by the area (based on forecasts from the G-BATS3 highway and public transport model) that is expected to experience a change in the cost of travel (including time-based costs) for users of the transport network. This assessment area is defined as the West of England Partnership (WEP) boundary.

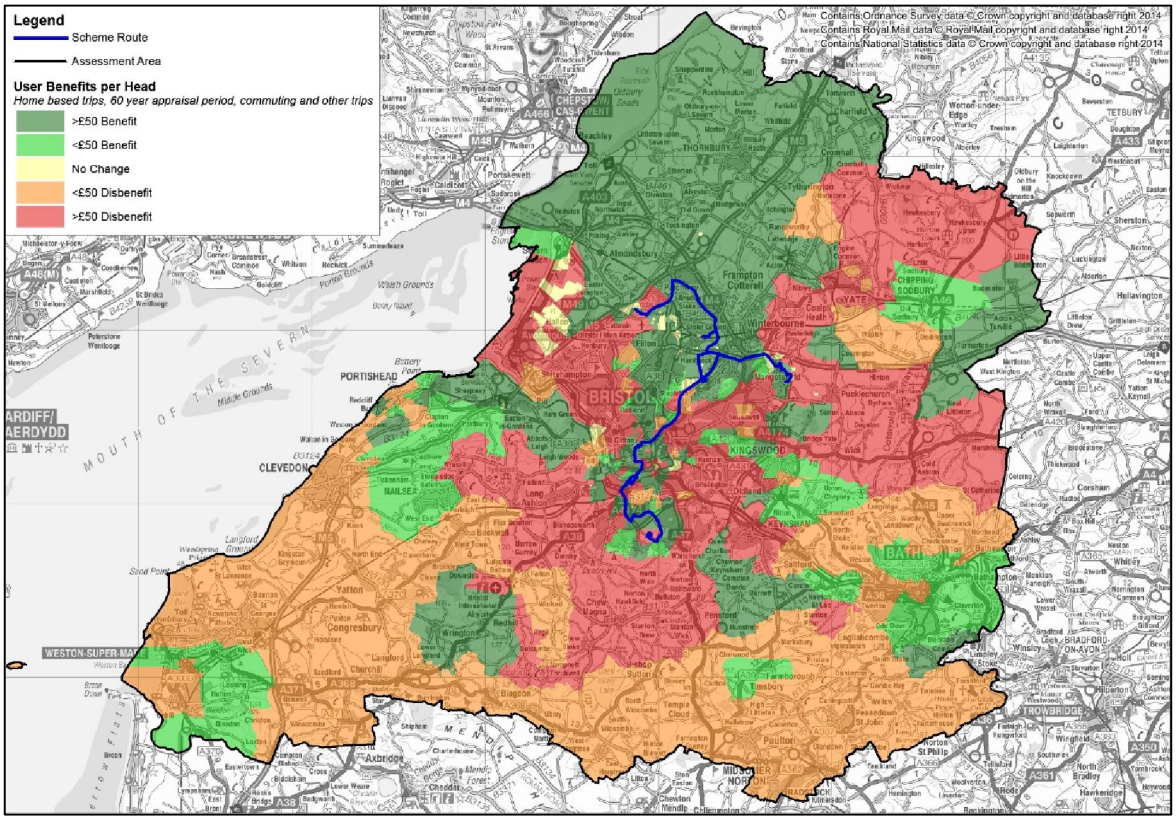
Whilst guidance suggests using the entire modelled area for the DI appraisal of user benefits, the highway model examines a core modelled area but also encompasses the rest of the UK as a series of outer zones. Using this wider modelled area would mean calculations in the outer zones requiring data aggregation and assumptions which may skew the user benefits DI appraisal. Consequently the core modelled local assessment area (see Figure 3-1) is being used, enabling a finer degree of accuracy. However, it is important to note that user benefits may be experienced by people living in areas outside of the modelled area, but these are not included in this appraisal.

This user benefit assessment has been undertaken using TUBA outputs from the G-BATS3 model and follows TAG Unit 4.2. TUBA calculations for the DI appraisal are based on the following:

- Home based trips (using AM origins as home location, PM destinations as home location and splitting IP trips equally);
- Home based trips calculated using ‘commuting and other’ trips from SATURN model (i.e. excluding business travel);
- Only internal to internal trips within the assessment area; and
- 60 year appraisal period.

Figure 3-1 overleaf spatially demonstrates the calculated user benefits as a result of the proposed scheme. North Bristol has large areas receiving more than £50 of benefit per head, and there are also benefits along the A38 Gloucester Road corridor and in south and east Bristol close to the scheme. Parts of west Bristol, as well as south and east Bristol further away from the scheme experience some disbenefits.

Figure 3-1 User benefit assessment area



3.1.3. Identification of social groups in assessment area (Step 2b)

In the case of user benefits, it is necessary to understand the income distribution of potential users in the assessment area. This has been undertaken by mapping variations in income deprivation using data from the Indices of Deprivation (IoD 2010) Income Domain at Lower Super Output Area (LSOA) level, according to their national rank.

As shown in Table 3-1, only 11% of residents within the assessment area are within the most deprived income quintile (quintile 1 – the 20% most deprived LSOAs nationally), while 31% of residents are within quintile 5, making them amongst the 20% least income deprived in England. Representation of residents in quintiles 2, 3 and 4 are all roughly in line with national levels.

Table 3-1 Proportions of each income quintile within user benefit assessment area

Income group	% Assessment Area (West of England Partnership area)	% England
Quintile 1 (most deprived)	11.4%	20.0%
Quintile 2	18.3%	20.0%
Quintile 3	17.9%	20.0%
Quintile 4	21.9%	20.0%
Quintile 5 (least deprived)	30.5%	20.0%

3.1.4. Identification of amenities in the area – Step 2c

Due to the extent of the assessment area for this user benefit appraisal there are a vast range of amenities within the area that will be key attractors and cause movement around the assessment area. The identification of amenities is not required in detail for this user benefit appraisal as all non business movements are already included within the TUBA assessment.

3.1.5. Appraisal of User Benefits DIs – Step 3

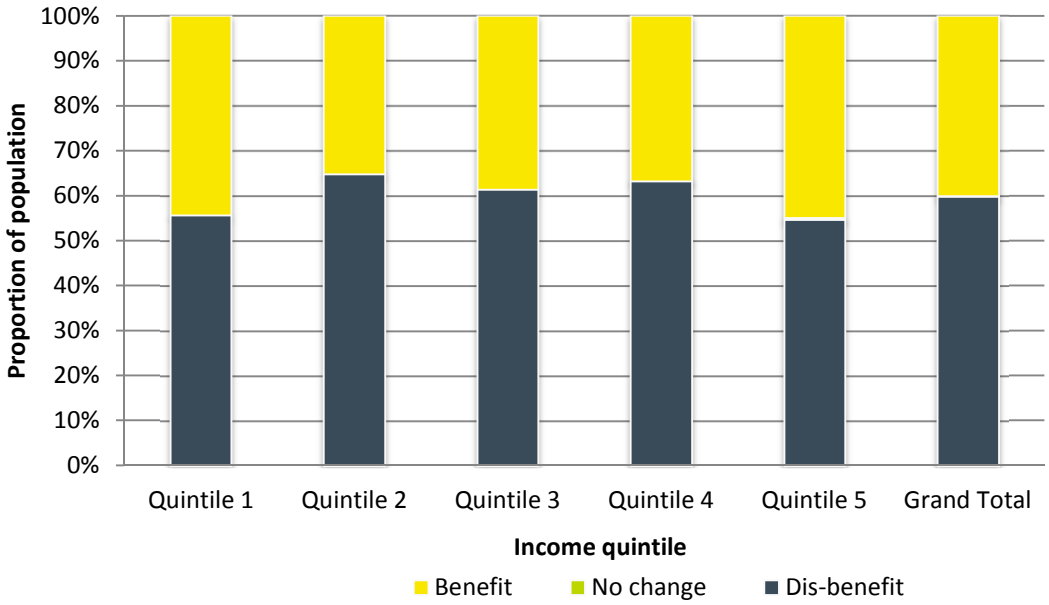
Less than 1% of residents in the assessment area experience no change as a result of the proposed scheme, and approximately 40% of residents experience a benefit, Table 3-2. There are 60% of residents who experience a disbenefit as a result of the scheme. In each income quintile, a higher proportion of residents experience a disbenefit than a benefit of the scheme. Residents in quintiles 1 and 5 (the most and least deprived quintiles) experience a slightly higher than average proportion of the benefits and a slightly lower than average proportion of the disbenefits, while residents in quintiles 2-4 experience a slightly lower than average proportion of the benefits and a slightly higher than average proportion of the disbenefits.

Table 3-2 Distribution of user benefits across population by income deprivation quintiles

Income Quintile	Residents - Number (%)			
	Benefit	No Change	Disbenefit	Total in assessment area
1 – Most Deprived	49,557 (44.4%)	0 (0.0%)	62,159 (55.6%)	111,716 (11.4%)
2	63,512 (35.2%)	0 (0.0%)	117,008 (64.8%)	180,520 (18.3%)
3	68,041 (38.6%)	0 (0.0%)	108,343 (61.4%)	176,384 (17.9%)
4	79,174 (36.7%)	76 (0.0%)	136,243 (63.2%)	215,493 (21.9%)
5 – Least Deprived	134,542 (44.9%)	1,411 (0.5%)	163,795 (54.6%)	299,748 (30.5%)
Total Population	**394,825 (40.1%)**	**1,488 (0.2%)**	**587,549 (59.7%)**	**983,861**

Figure 3-2 presents a graphical breakdown of the distribution of impacts across the five quintile groups for ease of interpretation.

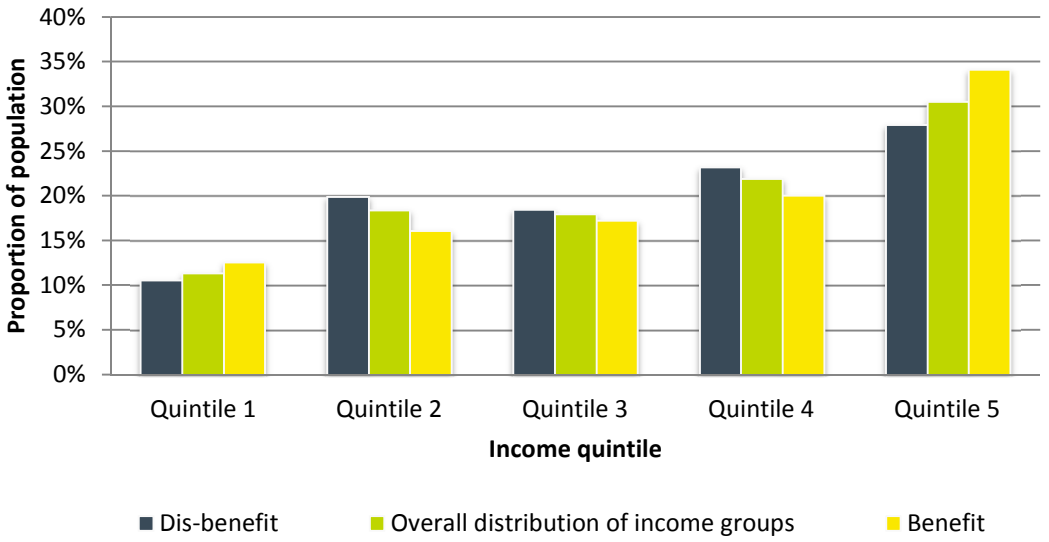
Figure 3-2 Distribution of user benefits across the population by income deprivation quintile



3.1.5.1. Distribution of benefits across the population

The DI appraisal demonstrates whether the impacts are distributed evenly across the vulnerable groups and identifies the 'winners' and 'losers' of user benefits as a result of the proposed scheme. An examination of the distribution of benefits and disbenefits compared to what may be expected from the overall distribution of benefits across the populations within each income quintiles is shown in Figure 3-3 below.

Figure 3-3 User Benefits - Distribution of benefits across the population by income deprivation quintile, compared to expected distribution



A proportionate distribution of benefits as a result of the proposed scheme should see the benefits and disbenefits mirror the overall distribution of population proportions within each income group in the assessment area (green column on Figure 3-3)**Error! Reference source not found.**. In this instance, for quintiles 1 and 5, a slightly higher than expected proportion of benefits and a slightly lower than expected proportion of disbenefits is experienced. The opposite is true for

quintiles 2, 3 and 4. However the distribution of benefits and disbenefits is generally roughly in line (+/-5%) of what would be expected from a fair distribution.

3.1.5.2. Value of benefits

The information presented so far shows the number of residents within the assessment area that are likely to experience a user benefit or disbenefit as a result of the scheme. It is however also important to understand the value of benefit and disbenefit the population in each income quintile are likely to experience as a result of the scheme. Aggregating these figures across the income quintiles identifies whether the value of benefits and disbenefits are equally distributed across the five income quintiles, as shown in Table 3-3 overleaf.

Overall there are net benefits from the scheme, approximately £113.7 million over the 60 year appraisal period. Following the WebTAG Unit 4.2 assessment criteria (as noted below), Table 3-3 outlines the assessment for each income quintile as follows:

- All of the income quintiles experience net user benefits overall;
- Income quintile 5 (the least deprived) is scored as large beneficial as the proportion of the population experiencing benefits in these quintiles is considerably larger than the proportion of the population in each group;
- Income quintiles 1 and 2 (the most deprived) are scored as moderate beneficial as the proportion of the population experiencing benefits within this quintile is in line with the proportion of the group overall (i.e. within +/-5%); and
- Income quintiles 3 and 4 are scored as slight beneficial as the proportion of the population experiencing benefits within these quintiles is considerably smaller than the proportion of the population in each group.

As there are overall net benefits for all quintile groups, the overall impact on user benefits is beneficial. The value of benefits favours those in the least deprived income quintiles, but the most deprived quintiles receive benefits in line with their proportion of the overall population and so the overall user benefits DI impacts has been appraised as **moderate beneficial.**

Table 3-3 Distribution of user benefit costs, by income deprivation quintile

	Income Quintile					Total
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	
Total population	111,716	180,520	176,384	215,493	299,748	983,861
Proportion of overall population	11.4%	18.3%	17.9%	21.9%	30.5%	-
Overall net benefits	£16,556,990	£23,673,878	£802,198	£20,110,529	£52,506,823	£113,650,418
Distribution of overall benefits	14.6%	20.8%	0.7%	17.7%	46.2%	-
Sum of benefits	£23,166,570	£45,331,442	£13,690,443	£41,603,156	£79,331,718	£203,123,328
Distribution of benefits	11.4%	22.3%	6.7%	20.5%	39.1%	-

	Income Quintile					Total
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	
Sum of disbenefits	-£6,609,580	-£21,657,563	-£12,888,244	-£21,492,627	-£26,824,895	-£89,472,910
Distribution of disbenefits	7.4%	24.2%	14.4%	24.0%	30.0%	-
Assessment	✓✓	✓✓	✓	✓✓	✓✓✓	

Key to individual assessment of each Income quintile	
Beneficial and 5% greater (or more) than the proportion of the group in the total popn	*Large Beneficial*
Beneficial and in line (+/-5%) with the proportion of the group in the total popn	*Moderate Beneficial*
Beneficial and 5% smaller (or less) than the proportion of the group in the total popn	*Slight Beneficial*
There are no user benefits or disbenefits experienced by the group	*Neutral*
A disbenefit which is 5% smaller (or less) than the proportion of the group in the total popn	*Slight Adverse*
A disbenefit which is in line (+/-5%) with the proportion of the group in the total popn	*Moderate Adverse*
A disbenefit which is 5% greater (or more) than the proportion of the group in the total popn	*Large Adverse*

3.2. Noise Assessment

3.2.1. Introduction

Any intervention that increases traffic levels and/or speeds or reduces physical distances between people and traffic will give rise to noise impacts within a localised area. The noise appraisal has examined the level of noise before scheme implementation (Do Minimum scenario) and the noise levels expected as a result of the scheme (Do Something scenario) for the opening year (2018), in accordance with DI WebTAG A4.2.3 (Step 2).

Analysis of the demographic profile of areas likely to be affected has been completed through the examination of the Indices of Deprivation 2010 (ID) income domain population, proportions of children under 16 years of age from Census 2011 data and the locations of schools (Steps 2b and 2c).

3.2.2. Confirmation of impact assessment area – Step 2a

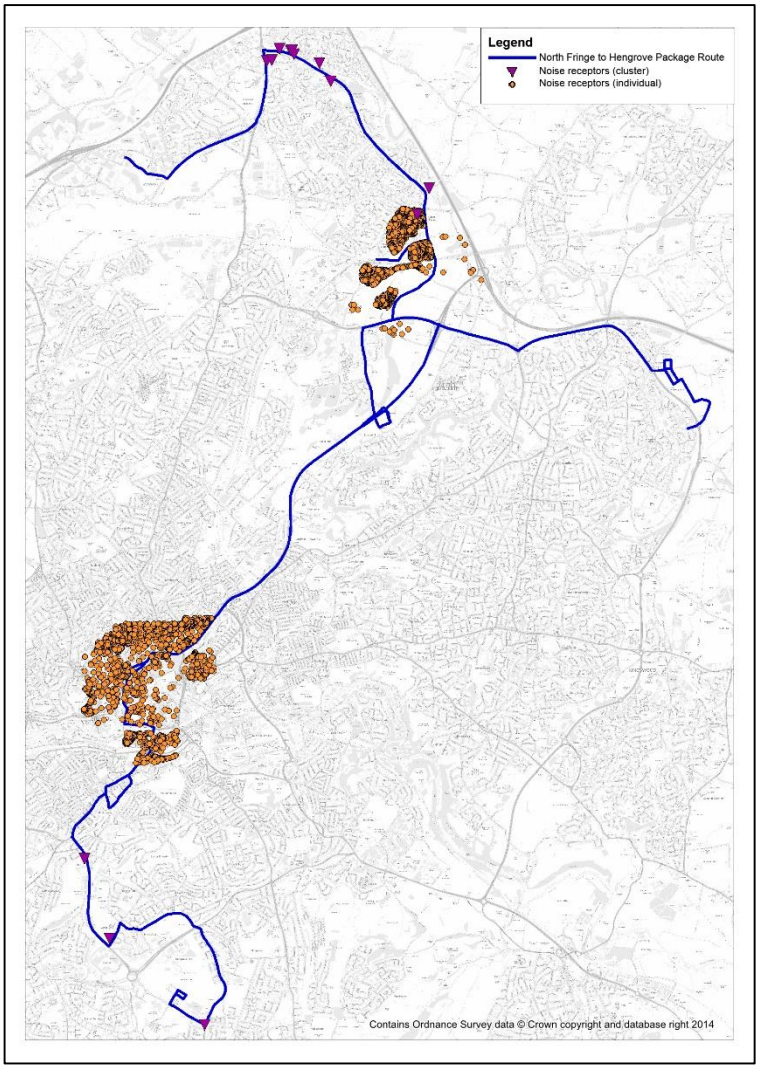
Noise impacts may result from changes in:

- Road alignment (vertical and horizontal);
- Sound generation (traffic flow, speed, gradient and road surface type);
- Sound propagation (ground absorption, screening, reflection and scattering).

Determining the area affected by noise level changes required an assessment of the highway links with significant changes in noise levels (>1dBA) within a 600m distance of the proposed scheme alignment. Over 3,200 receptors surrounding these links have then been assessed to identify the

impact of the scheme of noise in the opening year. The receptors included within the noise assessment are shown in Figure 3-4.

Figure 3-4 Receptors included within noise assessment

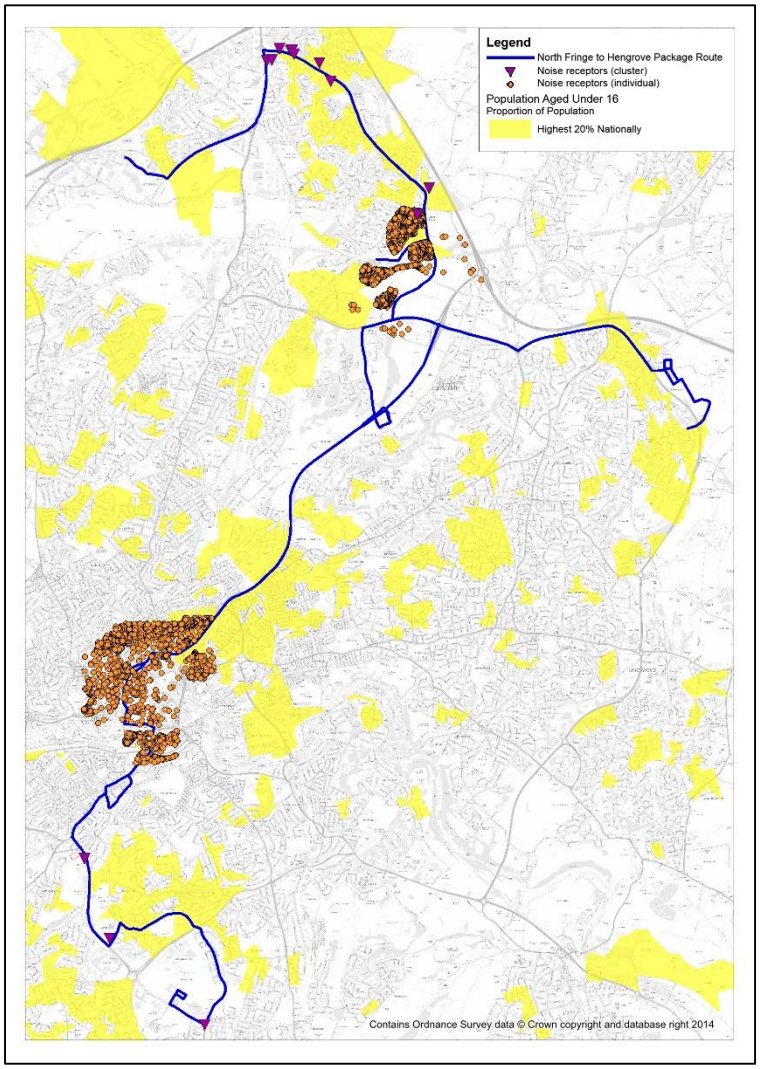


It should be noted that the noise assessment has used both individual receptors (i.e. individual properties), and sample receptors (i.e. one property to represent a road or link) and therefore the results presented in this DI appraisal will use both of these outcomes. Information on the number of properties included within the sample receptors is only available where there is a non-negligible change in noise levels as a result of the scheme, and therefore the statistics provided for receptors with 'no change' are indicative only.

3.2.3. Identification of social groups in the area – Step 2b

Children are particularly vulnerable to the effects of noise. Figure 3-5 shows the receptors included within the noise assessment along with the areas with the highest percentage of under 16s within the West of England area. This shows a high proportion of children aged under 16 towards the north of the scheme around Bradley Stoke and Stoke Gifford and south of the scheme around Knowle.

Figure 3-5 Noise assessment receptors and concentrations of children (under 16's, Census 2011)



The breakdown of children in the assessment area compared with local and national levels is shown in Table 3-4. This shows the proportion of children in the assessment area (600m of the scheme alignment) is in line with the local and national levels.

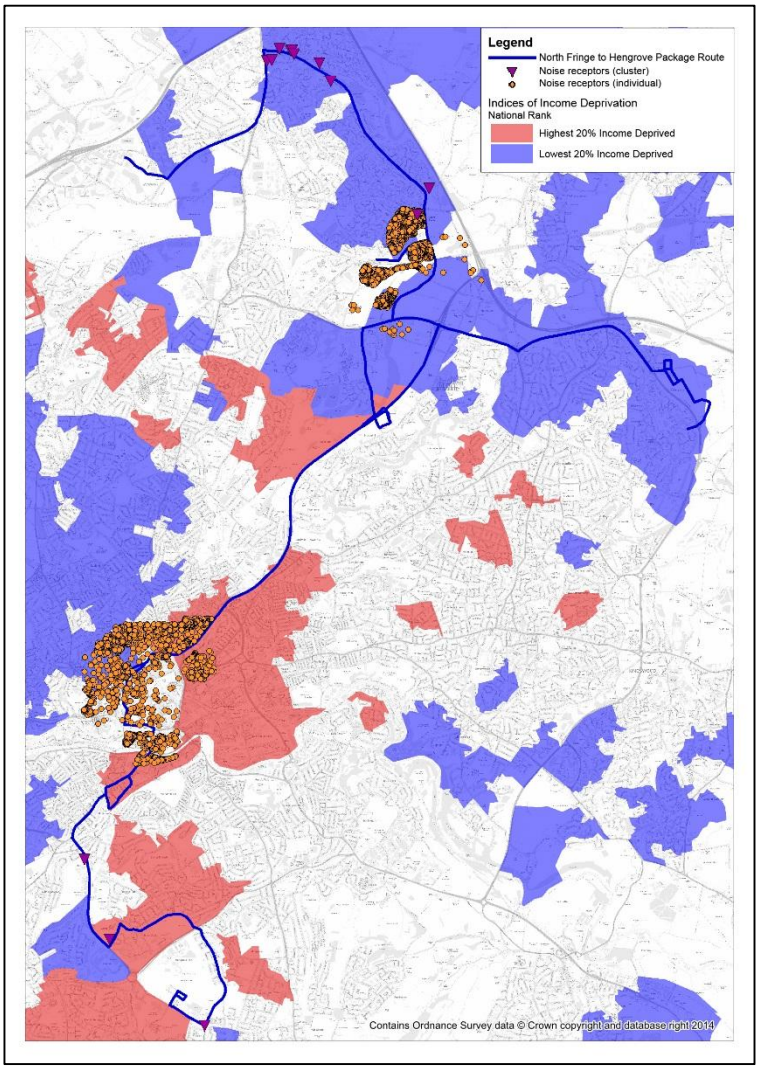
Table 3-4 Population of children in assessment area compared to local and national figures

	% of children
Noise assessment area (600m of scheme alignment)	19.3%
West of England Partnership Area	18.2%
England	18.7%

The DI appraisal also requires the assessment of noise impacts against income deprivation to identify the various levels of impacts experienced by households located in areas with different income deprivation. Income deprivation has been plotted using data from the Indices of Deprivation (ID 2010) Income Domain at a Super Output Area (SOA) level along with the location of noise receptors as shown in Figure 3-6. This illustrates that the northern part of the scheme sits

predominantly within areas identified in the top 20% least income deprived nationally and the southern part of the scheme sits predominantly within areas identified in the top 20% most income deprived nationally.

Figure 3-6 Noise assessment receptors and Income Deprivation (2010)



Around 19% of the receptors included within the noise assessment are located within the 20% most deprived areas nationally in terms of income deprivation. Over two thirds of the receptors are located within income quintiles 4 and 5 – the least deprived areas nationally.

Table 3-5 identifies that the majority of the population (90.4%) in the noise assessment area experience no change in noise levels as a result of the proposed scheme[2]. There are fewer people experiencing an increase in noise (6.3%) than experiencing an increase (3.3%).

All receptors within the most deprived income quintile experience no change as a result of the scheme. Income quintile 4 experiences the largest benefits in terms of noise as nearly 15% of receptors in this quintile experience a decrease in noise levels. All the receptors in income quintile 3 experience an increase in noise.

[2] 7 sample receptors experience a negligible change in noise levels in the opening year, however the number of properties these sample receptors represent is not available and is therefore not presented in these calculations

Table 3-5 Distribution of Noise impacts across income deprivation quintiles

		Noise Impact		
		Decrease	No Change[2]	Increase
Income Quintile	1 - most deprived	0 (0/0%)	636 (100.0%)	0 (0.0%)
	2	25 (5.8%)	394 (91.2%)	13 (3.0%)
	3	0 (0.0%)	0 (0.0%)	3 (100.0%)
	4	171 (14.7%)	974 (83.6%)	20 (1.7%)
	5 - least deprived	11 (1.1%)	950 (92.0%)	72 (7.0%)
Total		207 (6.3%)	2,954 (90.4%)	108 (3.3%)

Figures 3-7 to 3-9 show the noise assessment outcomes for each receptor. Figure 3-7 shows the entire assessment area. Figure 3-8 details the results around the city centre, showing an increase in noise around College Green, Unity Street and Redcliff Street, and decreases in noise around King Street, Welsh Back, Quay Street and Upper Maudlin Street. Figure 3-9 presents the results around Parkway showing a decrease in noise around Church Road and Hambrook Lane

Figure 3-7 Noise assessment outcome

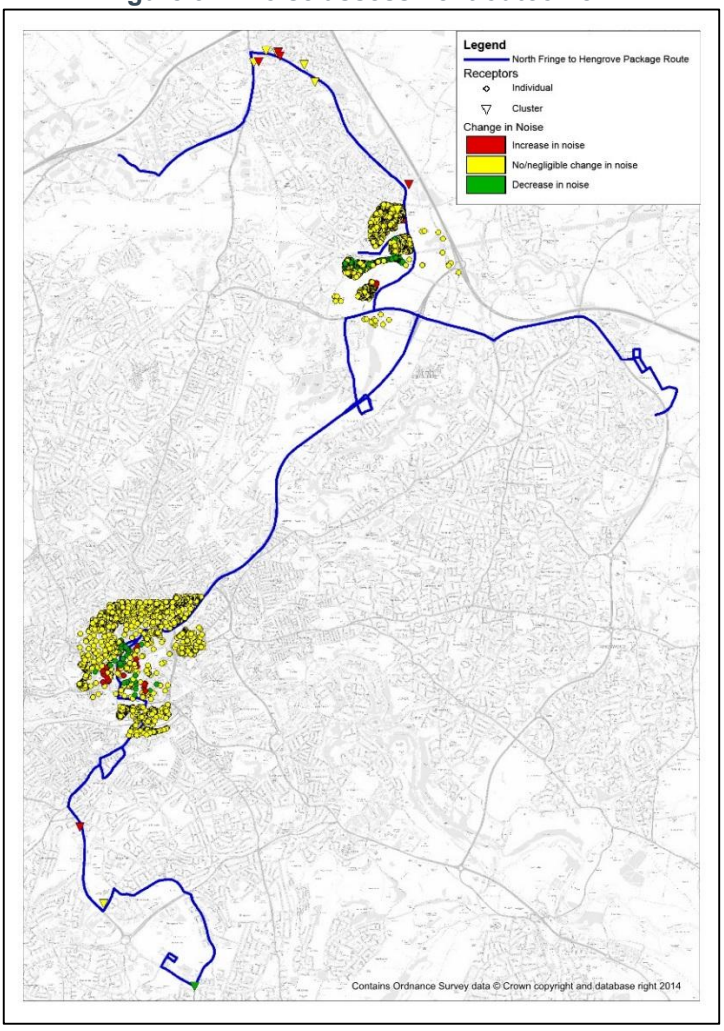


Figure 3-8 Noise assessment outcome – City Centre

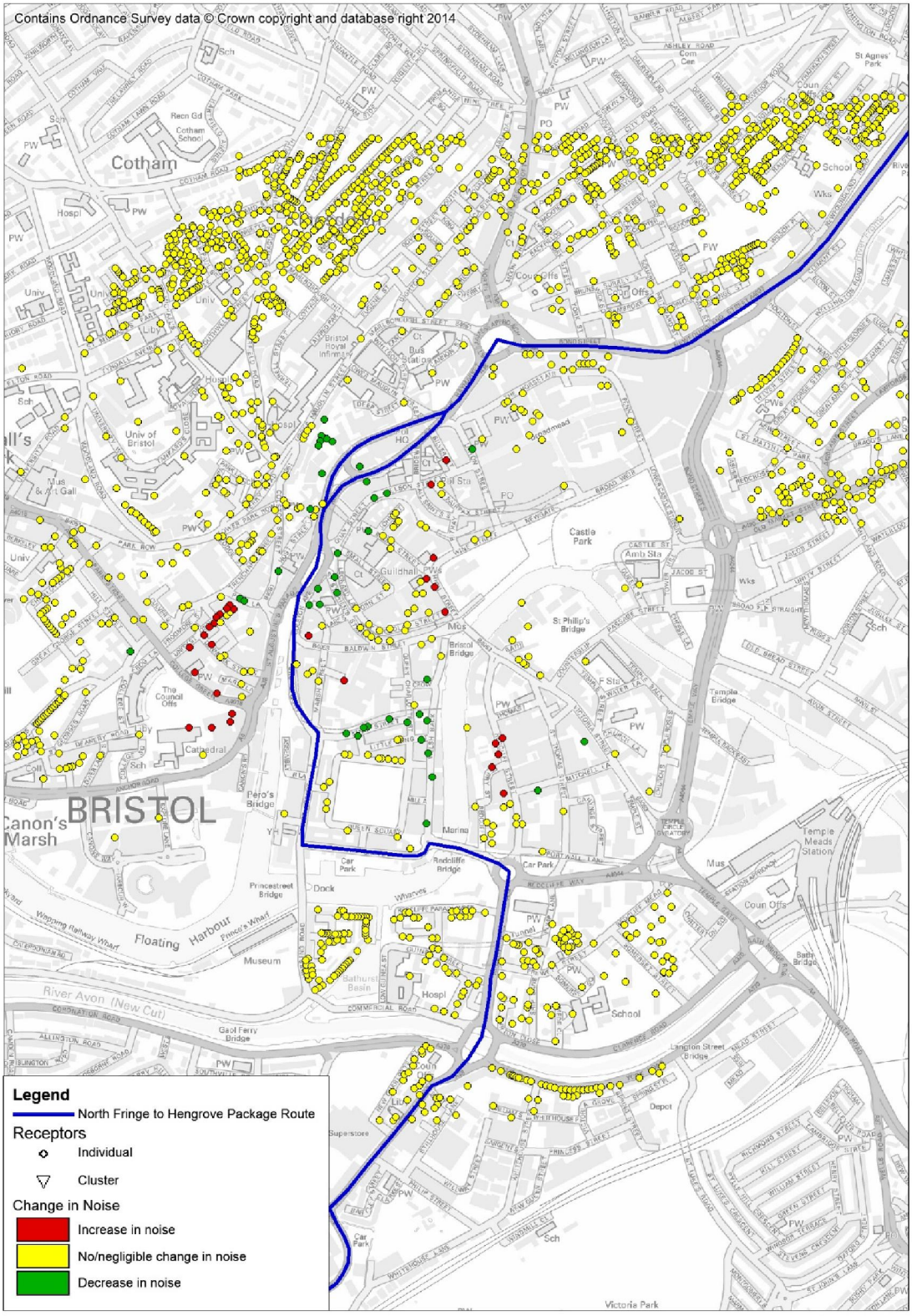
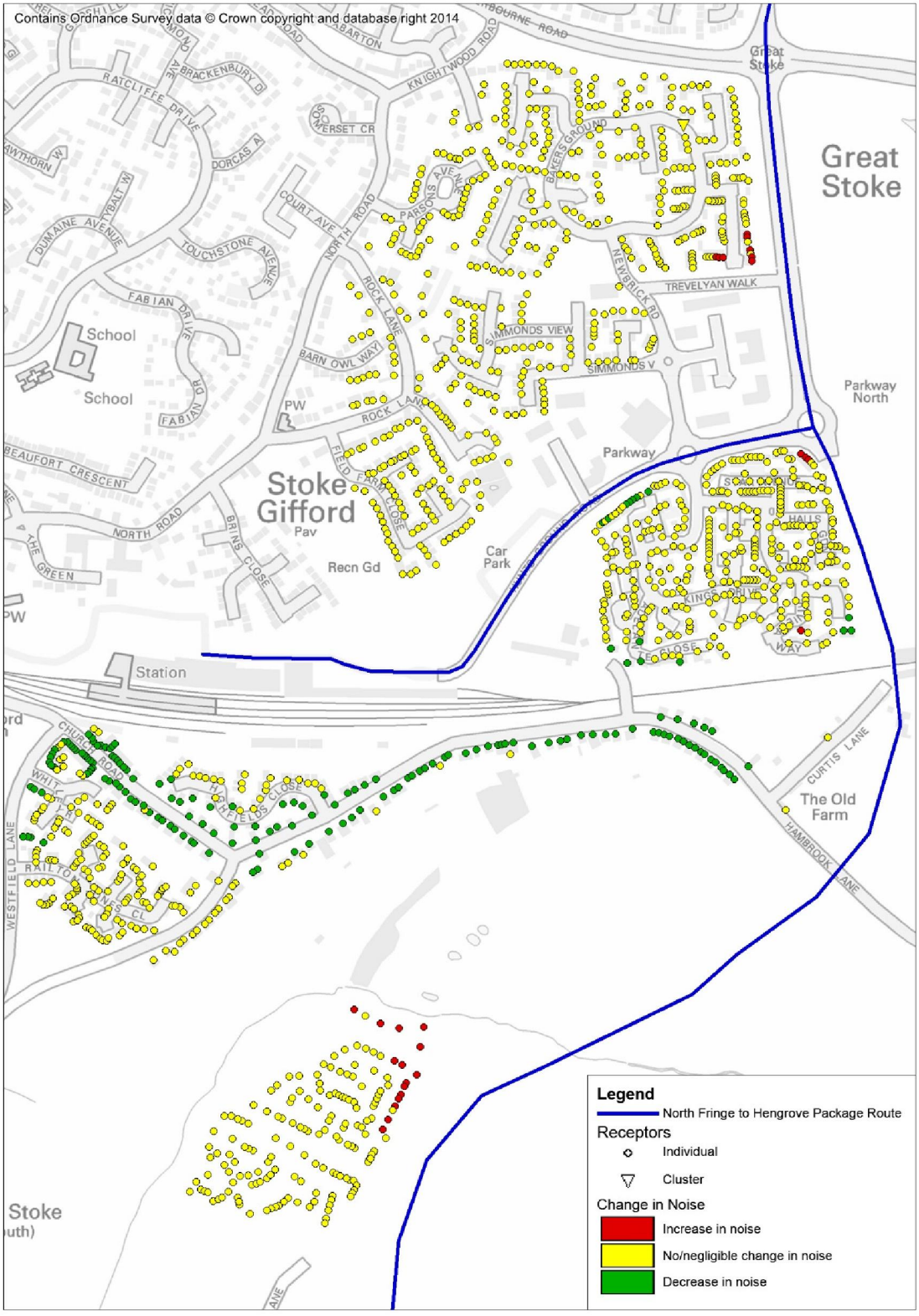


Figure 3-9 Noise assessment outcome - Parkway



It should be noted that the noise assessment has used both individual receptors (i.e. individual properties), and sample receptors (i.e. one property to represent a road or link) as identified in Figure 3-4. Information on the number of properties included within the sample receptors is only available where there is a non-negligible change in noise levels as a result of the scheme, and

therefore the statistics provided for receptors with 'no change' above are indicative only. From this point forward, only receptors with a non-negligible change in noise levels will be presented.

3.2.4. Identification of amenities in the area – Step 2c

In addition to other local attractors for children (i.e. parks and open spaces, playgrounds), there are a number of receptors included within the noise assessment which will increase movement and the daytime population of children, as follows:

- Schools – Bristol Cathedral School, Bristol Grammar School, St Michael on the Mount C of E Primary School, St Mary Redcliffe & Temple C of E V A School, Cabot Primary School, St James & St Agnes Nursery School, Rosemary Nursery School and Family Unit
- Nurseries – Leapfrog Day Nursery, St Pauls Day Nursery
- Children's healthcare – Children's Hospices, Bristol Royal Hospital for Sick Children,
- Other – Redcliffe Early Years Centre, St Pauls Learning and Family Centre

All of these receptors are forecast to have a negligible change in noise as a result of the NFHP.

3.2.5. Appraisal of Noise DIs – Step 3

The DI appraisal demonstrates whether the noise impacts as a result of the proposed scheme are distributed evenly and contextualises who the likely 'winners' and 'losers' in terms of vulnerable groups. Over 90% of receptors within the noise analysis experience no change as a result of the scheme. Slight beneficial impacts are experienced by those in income quintiles 2 and 4 as a higher proportion of receptors in these quintiles experience a decrease in noise than an increase. Income quintile 3 has a significant adverse impact as all properties within this quintile experience an increase in noise levels; however it should be noted that this only represents three receptors. Those in the most deprived income quintile experience no change as a result of the scheme. The overall DI appraisal for noise is **slight beneficial**, as the vast majority of the population do not experience any change in noise levels, and where there is a change, twice as many receptors experience a decrease in noise levels as an increase.

Noise levels can have an impact on children's concentration and cognitive ability. Although there are concentrations of children in areas surrounding the scheme and resident in the receptors analysed, as identified there are only a few areas where there is a deterioration in noise levels. In addition, the noise impact on a number of receptors used by children (schools, nurseries, children's health centres) has been assessed, and only a negligible impact has been identified. The DI appraisal therefore considers there to be a **neutral impact on children** as a result of the scheme.

Table 3-6 Noise impacts by income distribution

	IoD Income Domain					
	Most deprived				Least deprived	
	0-20%	20-40%	40-60%	60-80%	80-100%	Total
Properties in each group with increased noise	0	13	3	20	72	108
Properties in each group with decreased noise	0	25	0	171	11	207
Net no of Winners / Losers in each group	0	12	-3	151	-61	99
Net winners/losers in each area as percentage of total	0.0%	2.8%	(100.0%)	13.0%	(5.9%)	
Share of total population in the assessment area	19.5%	13.2%	0.1%	35.6%	31.6%	
Assessment	**0**	✓	xxx	✓	x	

3.3. Air Quality Assessment

3.3.1. Introduction

Any intervention that increases traffic levels (especially HGVs) and increases the amount of slow moving traffic or reduces physical distances between people and traffic may give rise to impacts on air quality.

Analysis of the demographic profile of the areas likely to be affected has been undertaken using the Indices of Deprivation 2010 (ID) income data and the proportions of children under 16 years of age (Census 2011 data). The outputs from this analysis have been used to assess the impacts of air quality changes on vulnerable groups and complete a matrix of DI findings on air quality. This assessment focuses on nitrogen dioxide (NO_2) impacts and also examines the change in particulate matter less than 10µm aerodynamic diameter (PM10) levels as a result of the scheme.

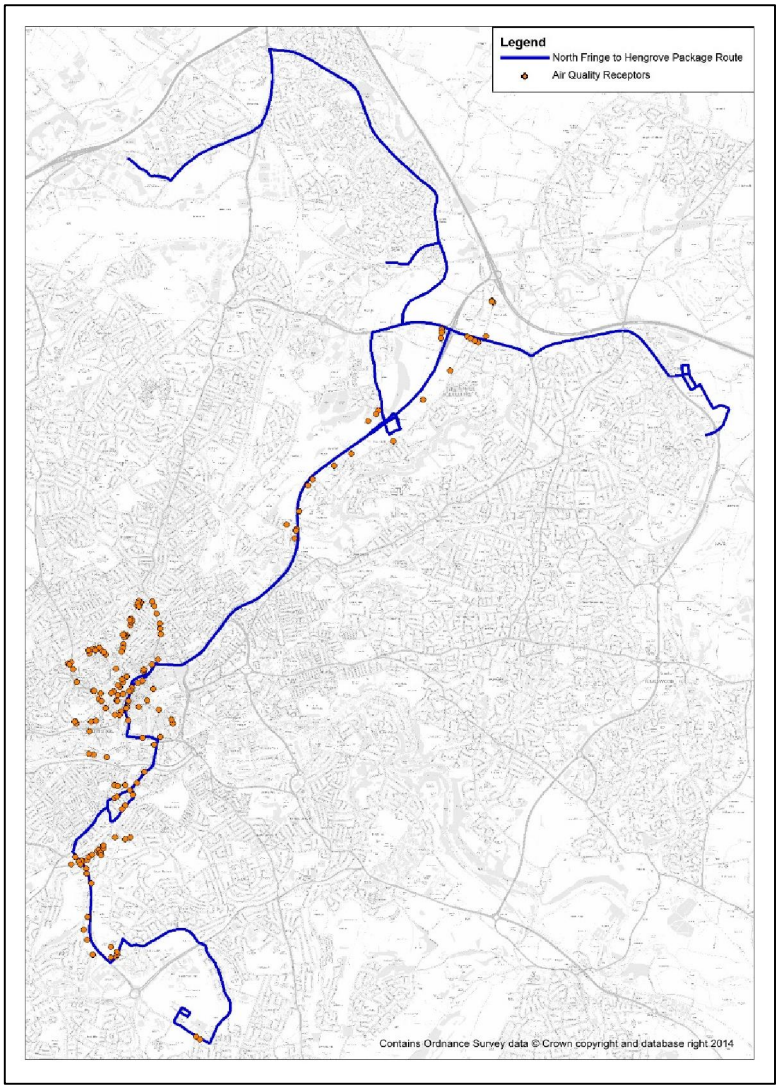
3.3.2. Confirmation of impact assessment area – Stage 2a

The assessment area has been defined from the air quality assessment and identifies a number of network links affected (as specified in WebTAG DI unit A3.2). The following criteria to identify the Affected Road Network (ARN):

- Road alignment will change by 5m or more, or
- Daily traffic flows will change by 1,000 annual average daily traffic (AADT) or more, or
- HDV (Heavy Duty Vehicle) flows will change by 200 AADT or more, or
- Daily average speed will change by 10 km/hr or more, or
- Peak hour speed will change by 20 km/hr or more.

The impact of NO2 and PM10 on receptors within a 200m buffer of each highway link in the ARN have been identified and classified as minor, moderate or major beneficial or adverse, or negligible or no change. Receptors included within the analysis are shown in Figure 3-10. A total of 168 receptors are included within the air quality assessment.

Figure 3-10 Receptors included within air quality assessment

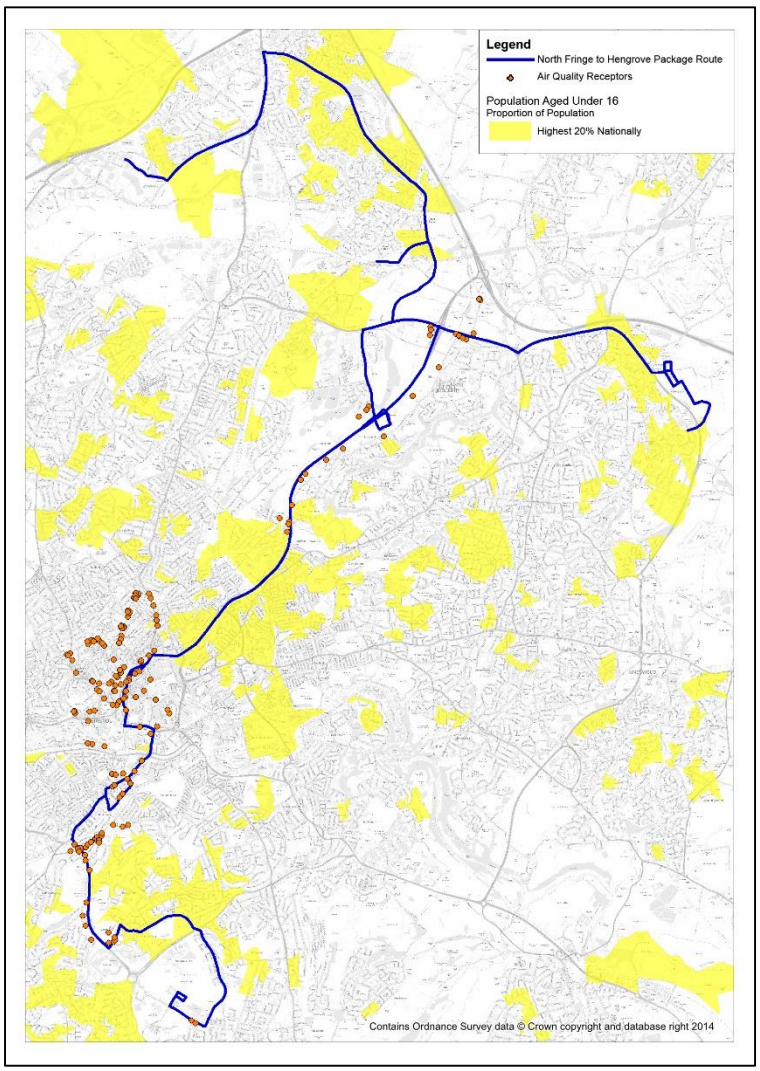


3.3.3. Identification of vulnerable groups in the area – Stage 2b

Children are particularly vulnerable to the effects of air quality. Appendix B Figure 1 identifies that there are clear concentrations of children within close proximity to the scheme. A total of 18.4% of the population within 200m of the scheme are aged under 16, which is in line with local and national figures.

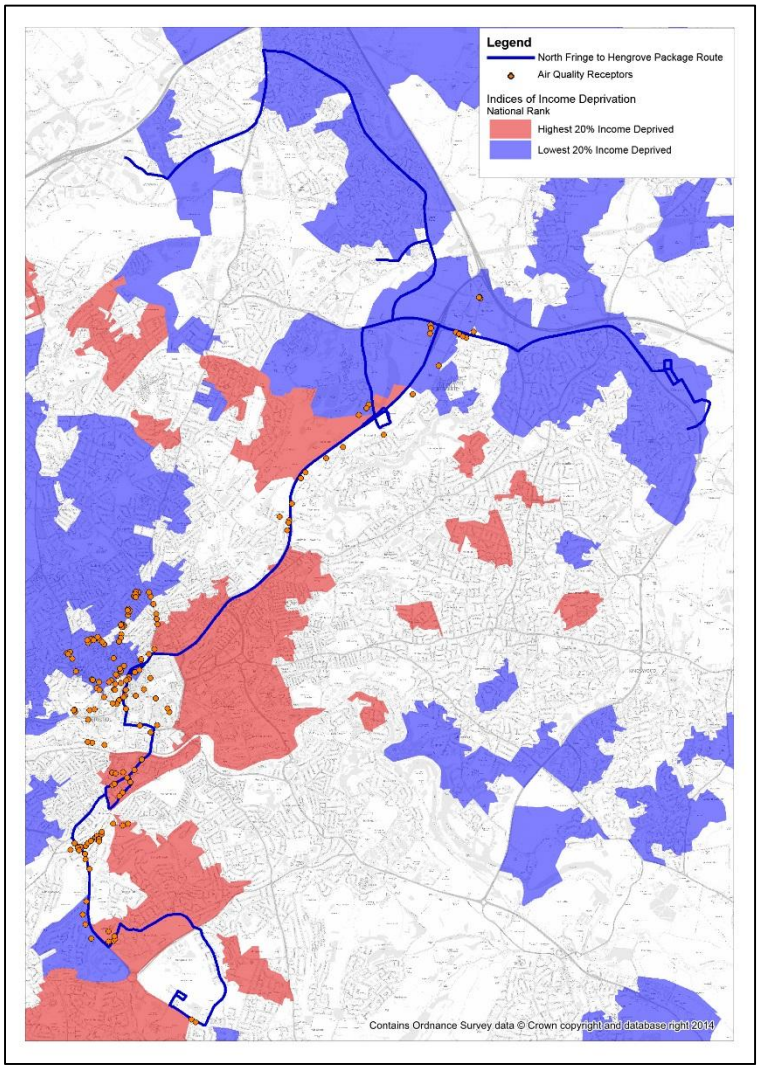
Figure 3-11 displays the receptors included within the air quality analysis against known concentrations of children within the area. Although the receptors are generally not in the 20% highest populated areas nationally for children, it is important to consider the presence of children within residential households included within the air quality analysis.

Figure 3-11 Air quality assessment receptors and concentrations of children (under 16s, Census 2011)



The DI guidance requires an assessment of air quality impacts against income deprivation using data from the Indices of Deprivation (ID 2010) Income Domain. This information is presented at a national rank of Super Output Areas (SOA) and is used to identify impacts experienced by households located within areas of different national income deprivation as shown in Figure 3-12. This shows that receptors included within the air quality assessment are located within both the most, and least deprived income quintiles nationally, and therefore highlights the importance of examining the impact of air quality as a result of the scheme on the varying income groups.

Figure 3-12 Air quality assessment receptors and income deprivation (2010)



This DI appraisal looks at the impact on air quality in the opening year between the Do Minimum and Do Something scenarios. An examination of the impact on air quality by income deprivation quintile can be seen in Table 3-7. This shows the NO_2 and PM_{10} air quality assessment has demonstrated that all receptors identified in the air quality assessment experience a negligible change in air quality in the opening year.

Table 3-7 Distribution of air quality impacts across income deprivation quintiles

		Air Quality Impact (NO_2 and PM_{10})		
		Deterioration	Negligible Change	Improvement
Income Quintile	1 - most deprived	0	19	0
	2	0	42	0
	3	0	10	0
	4	0	33	0
	5 - least deprived	0	64	0
Total Properties		0	168	0

3.3.4. Identification of amenities in the area – Step 2c

As children are particularly vulnerable to the effects of air quality, it is important not only to consider the residential population in the assessment area, but also amenities that will result in numbers of children within the daytime population.

Within the air quality assessment area, there are four primary schools (Glenfrome Primary School, St Michael on the Mount C of E Primary School, Parson Green Primary School and Greenfield Primary School). Within the assessment area there is also a Children's Assessment Centre (Tyndalls Park Road), and The Bristol Royal Hospital for Sick Children. The presence of these amenities indicates high levels of movement from children within the air quality assessment area who may feel the effects of any change in air quality.

3.3.5. Appraisal of Air Quality DIs – Stage 3

The DI appraisal for air quality identifies the winners and losers as a result of the NFHP in terms of air quality and demonstrates an overall net disbenefit/benefit on the population within the impact assessment area. As the air quality assessment has identified that all receptors experience a negligible change in air quality in the opening year as a result of the scheme, **no further DI appraisal is required.**

3.4. Accidents Assessment

3.4.1. Introduction

Any intervention that increases traffic levels and speeds or reduces physical separation between people and traffic can give rise to increases in accidents. The approach for the DI appraisal of accidents uses data from the accident assessment as well as STATS 19 data from the DfT's Road Casualties online database[3]. The approach identifies accident locations (Step 2a) and, where available, the age and gender of casualties to assess any impacts on vulnerable groups (Step 2b). Step 2c identifies amenities within the assessment area that are likely to be used by vulnerable groups. The outputs from this then feed into the full appraisal process in Step 3 to determine impacts and complete a matrix of DI findings.

3.4.2. Confirmation of impacted area – Step 2a

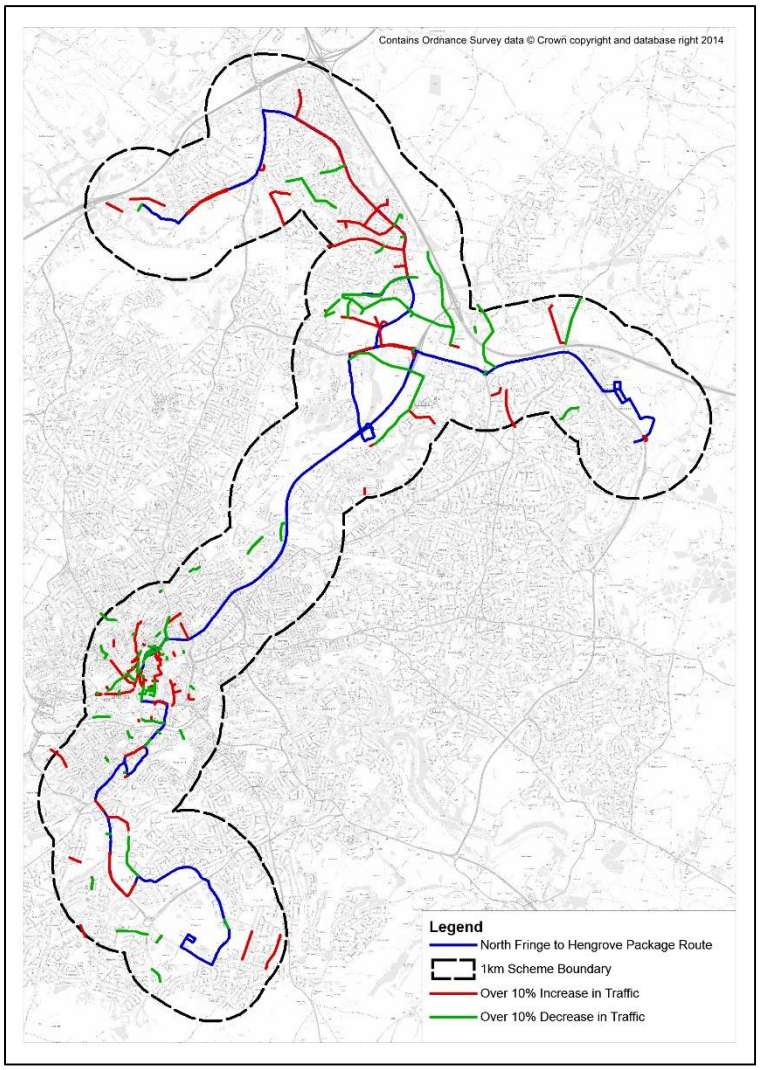
In order to identify the impacted area for the accident assessment an analysis was undertaken to identify all links on the modelled network within a 1km boundary of the scheme experiencing a

[3] http://data.gov.uk/dataset/road-accidents-safety-data

change in traffic flow of +/- 10% (it becomes increasingly inaccurate to predict the accident rate on traffic flow changes further away from the scheme).

Accident analysis outputs from the accident model were then used to identify the Do Minimum and Do Something accident numbers for each link in the impacted area. Each link was then classified according to the rate of change of the number of accidents between the Do Minimum and Do Something scenarios (as shown in Figure 3-13).

Figure 3-13 Links forcast to experience a change in accident levels



3.4.3. Identification of vulnerable groups in the area – Step 2b

There are several potential vulnerable groups in terms of accidents including children and younger people, young men (particularly as drivers) and older people as well vulnerable road users such as pedestrians, cyclists and motorcyclists. There is also evidence that people living in more deprived areas are more vulnerable to accidents on the highway network.

Appendix B, Figures 1, 2, and 4 highlight areas with the highest percentage of under 16s, young people (16-25 years) and older people within a 1km buffer[4] of the scheme alignment.

Analysis has been undertaken to identify concentrations of vulnerable groups that may be impacted as a result of the North Fringe to Hengrove Package by using STATS 19 data on personal injury

[4] 1km buffer area only contains links where the a-b and b-a flow in both the Do Minimum and Do Something networks match.

accidents for the five years from 2009 to 2013[5]. This data profiles casualties by age, gender and type of road user and deprivation score and is used to identify the baseline conditions in terms of victim typology. Table 3-8 presents this data at a national and assessment area level for comparison.

Table 3-8 All accident casualties (2009 – 2013)

	All Casualties (national rate)		All Casualties (assessment area)	
	N	% of all casualties	N	%
Vulnerable Users				
Pedestrians	132,630	11.5%	636	19.3%
Cyclists	90,762	7.8%	755	22.9%
Motorcyclists	103,342	8.9%	376	11.4%
Male drivers aged 16-25	118,082	10.2%	552	16.7%
Vulnerable Groups				
Under 16	98,945	8.5%	212	6.4%
People aged 75+	35,110	3.0%	65	2.0%
Deprivation				
20% Most deprived LSOAs in UK	216,882	20.8%	726	22.0%
20% Least deprived LSOAs in UK	187,984	18.1%	567	17.2%

Table 3-8 shows that the proportion of pedestrian casualties is higher in the assessment area (19.3%) than nationally (11.5%), as is the proportion of cyclist casualties (22.9% in the assessment area, almost three times the national level of 7.8%). The proportion of casualties in the assessment area involving young male drivers (16.7%) and motorcyclists (11.4%) is also higher than national levels (10.2% and 8.9% respectively).

The proportion of accidents involving residents from the most and least deprived areas nationally is generally in line with national levels.

Table 3-9 profiles casualties between 2009 and 2013 by vulnerable user type, age groups and residential deprivation score for the highway network links experiencing benefits or disbenefits in accident savings.

Nearly a third of pedestrian accidents have happened on links where there is forecast to be an increase in accident rates (disbenefit) as a result of the scheme, compared to only 22% of pedestrian accidents on links where there is forecast to be a reduction in accident rates (benefit). The opposite is true for cyclists, where a higher proportion of accidents have happened on links forecast to benefit in terms of accident rates as a result of the scheme.

Accidents involving people aged under 16 and people over 75 are slightly more likely to occur on those links where accidents are likely to decrease as a result of the scheme. Accidents involving residents of the 20% most deprived areas are slightly more likely to occur on links with decreasing

[5] Road Casualties Online
http://www2.dft.gov.uk/pgr/statistics/datatablespublications/accidents/roadcasualtiesonline/index.html

accidents, while accidents involving residents of the 20% least deprived areas are slightly more likely to occur on links with increasing accidents.

Table 3-9 Summary of accident savings from analysis (2009 and 2013)

Casualty Type	Benefit		Disbenefit	
	N	%	N	%
Vulnerable User				
Pedestrians	40	21.9%	87	30.4%
Cyclists	51	27.9%	71	24.8%
Motorcyclists	17	9.3%	32	11.2%
Male drivers aged 16-25	38	20.8%	60	21.0%
Vulnerable Groups				
People aged under 16	10	5.5%	11	3.8%
People aged 75+	4	2.2%	4	1.4%
Deprivation				
20% Most deprived LSOAs in UK	33	18.0%	45	15.7%
20% Least deprived LSOAs in UK	36	19.7%	70	24.5%

3.4.4. Identification of amenities in the area – Step 2c

Accident and casualty statistics relate to people travelling (by any mode) within the accident assessment area and therefore the impact of local amenities that attract vulnerable groups need to be considered within the DI appraisal. Due to the extent of the accident assessment area for this accident assessment there are a vast range of amenities within the area that will attract vulnerable groups hence adding to the movement and daytime population of those considered vulnerable to any impact on accidents.

3.4.5. Appraisal of Accident DIs – Step 3

The analysis of road casualty and accident data has shown that although the majority of roads are experiencing no change or negligible impact on accidents, there are more links that will experience an increase in accident rates ('disbenefit') than those experiencing an decrease ('benefit'). Detailed analysis shows that accidents involving the vulnerable groups are, on average, just as likely to occur on links experiencing a decrease in accidents rate as those experiencing an increase in accidents rates. The levels of vulnerable group accidents on links are broadly similar, with some groups (cyclists, children, older people and those resident in the 20% most deprived LSOAs) having slightly higher proportions on links benefiting from the scheme and other groups (pedestrians, motorcyclists, young male drivers) having slightly higher proportions on links experiencing a disbenefit. Although there is some variation of impact on vulnerable groups (Table 3-10), overall the DI appraisal for the NFHP has been assessed as **neutral**.

Table 3-10 Summary of the NFHP accident DI appraisal

Impact	DI appraisal
Pedestrians	×
Cyclists	✓
Motorcyclists	×
Male drivers aged 16-25	0
People aged under 16	✓
People aged 75+	0
20% Most deprived LSOAs in UK	✓
20% Least deprived LSOAs in UK	×

Key: ✓✓✓ = Large Beneficial
✓✓ = Moderate Beneficial
✓ = Slight Beneficial
0 = Neutral
× = Slight Adverse
×× = Moderate Adverse
××× = Large Adverse

3.5. Severance Assessment

3.5.1. Introduction

Severance is often an unintended consequence of a measure intended to address other problems. Severance issues may be identified at an early stage and in many cases a design solution may reduce or eliminate any negative impacts.

3.5.2. Confirmation of impact assessment area – Step 2a

The DI guidance recommends the assessment area for severance to include any location with physical changes in road alignment or where links on the road network will experience significant changes in traffic flows and or speeds (>10%).

The main physical change in road alignment is the Stoke Gifford Transport Link, and as severance affects those using non-motorised modes (especially pedestrians) a 1km buffer around the scheme will be considered for severance impacts as well as the area around the Stoke Gifford Transport Link.

3.5.3. Identification of vulnerable groups in the area – Step 2b

There are certain groups that are particularly vulnerable to the effects of severance. These include no car households, older people, children and people with disabilities. Analysis has been undertaken for the population within the assessment area shown in Figures 1, 4, 6 and 7 of Appendix B. The results of the analysis are shown in Table 3-11.

Table 3-11 Proportion of vulnerable groups within severance assessment area compared to local and national proportions

Vulnerable Group	Assessment Area (1km buffer of scheme)	West of England Partnership Area	England
Older People (Aged 70+)	5.1%	7.9%	17.3%
Children (People Aged Under 16)	18.7%	18.2%	18.7%
No Car Households	28.8%	21.7%	25.8%
Disability Living Allowance Claimants	7.2%	7.1%	3.7%

This shows that although the percentage of older people in the area is lower than local and national rates. There are a higher proportion of residents without access to a car in the assessment area compared to local and national levels, which highlights that there is likely to be a higher rate of walking in the assessment area (either walking for entire journey, or to access other transport modes).

3.5.4. Identification of amenities in the area – Step 2c

Due to the extent of the assessment area for this severance appraisal there are a vast range of amenities within the area that will be key attractors and cause movement around the assessment area, and particularly movement from vulnerable groups. A detailed list has not been provided here due to the size of the assessment area considered within this severance appraisal; however due regard will be paid to the likely daytime population of the assessment area caused by local attractors (schools, social centres, town centres, health centres etc) within this severance appraisal.

3.5.5. Appraisal of Severance DIs – Step 3

The NFHP involves a series of complementary measures that facilitate the development of three new MetroBus rapid transit routes, linking the North Fringe, East Fringe and South Bristol areas via Bristol City Centre. This includes the Stoke Gifford Transport Link to relieve congestion in the North Fringe and major public transport improvements to the M32 and Bristol City Centre. The new rapid transit routes will follow existing roads using on street infrastructure including bus lanes and priority at traffic signals. Any segregated busway has parallel pedestrian and cycle facilities including dedicated crossing points which will mitigate against any severance effect.

The main physical change in road alignment for the NFHP is the Stoke Gifford Transport Link. This area is currently greenfield site. There will be a segregated footway and cycleway running parallel to the road providing pedestrian and cycle links through the area. This is an area which has concentrations of young people, a group which is susceptible to the impacts of severance. To further alleviate the potential severance impacts the new at grade junctions will include crossing facilities.

Table 3-12 shows a breakdown of the DI appraisal for each vulnerable group considered within this assessment. Overall, taking into account the MetroBus rapid transit routes, pedestrian and cycle facilities, new crossing facilities and the new link road the scheme is considered to have a **moderate beneficial effect** on severance.

Table 3-12 Summary of the NFHP severance DI appraisal

Impact	Older People	Children	No car Households	People with disabilities
Large Beneficial				
Moderate Beneficial	✓	✓	✓	✓
Slight Beneficial				
Neutral				
Slight Adverse				
Moderate Adverse				
Large Adverse				

3.6. Personal Security Assessment

3.6.1. Introduction

Some schemes may introduce perceived or real security risks that affect transport choices by different groups of people. Where choices are constrained by concerns regarding security and especially where those affected do not have access to a car, access to certain places or travel at desired times may be denied to members of these groups.

3.6.2. Confirmation of impact assessment area – Step 2a

For the initial screening a broad understanding of the areas on which the transport scheme was likely to have an impact was used. Highway schemes are likely to impact on a wide range of users and therefore the definition of an assessment area is inappropriate. However, schemes relating to public transport, walking and cycling should consider the specific location where the scheme improvements are being made as well as the catchment area for walking to the scheme location.

It is anticipated that the improved network infrastructure and improved stops and crossings as part of NFHP will provide a positive impact on security. The increased use of CCTV and high standard of lighting at bus shelters and CCTV on the vehicles aim to provide high levels of security for users.

As the scheme is 20km long and improvements are to be made along the entirety of the route the area used for the security analysis has focused on areas where there are certain groups of vulnerable people. A 1km buffer has been included also in order to assess the impact on pedestrians who live and/or work in the area.

3.6.3. Identification of vulnerable groups in the area – Step 2b

There are certain groups that have particular concerns about their personal security including older people, children, women, black and minority ethnic residents and people with disabilities. Table 3-13 shows the concentration of each of these vulnerable groups compared to local and national levels.

Table 3-13 Proportion of vulnerable groups in security assessment area compared to local and national proportions

Vulnerable Group	Assessment Area (1km buffer of scheme)	West of England Partnership	England
Older People (Aged 70+)	5.1%	7.9%	17.3%
Children (People Aged Under 16)	18.7%	18.2%	18.7%
Women	49.6%	50.6%	50.8%
Disability Living Allowance Claimants	7.2%	7.1%	3.7%
Black and Minority Ethnic Residents	18.0%	9.1%	14.6%

This shows a relatively high proportion of people with disabilities compared to local and national rates and a considerably higher number of black and minority ethnic residents in comparison to the West of England Partnership area. The socio-demographic maps in Appendix B of this report provide an overview of the concentration and location of these groups within the assessment area. These include high concentrations of:

- Older people distributed within the 1km area, particularly towards the northern part of the scheme: Lockleaze; Broomhill and Frenchay. There are also concentrations in the city centre and in Hengrove and parts of Bedminster;
- Black and Minority Ethnic Residents distributed throughout the middle part of the scheme from Bedminster to Hambrook;
- Disability Living Allowance claimants living in the south end of the scheme in Hartcliffe and Filwood Park; in the city centre and towards the northern part of the scheme in Lockleaze and Broomhill; and
- Children living in Hartcliffe, Filwood Park and Bradley Stoke.

Whilst the proportion of children within the security assessment area is only slightly higher than the West of England area average and lower than the national average, there are more than 25 schools within a 1km of the scheme (see Step 2c).

3.6.4. Identification of amenities in the area – Step 2c

Due to the extent of the assessment area for this personal security appraisal, there are a number of amenities within the area that will attract vulnerable groups; hence adding to the movement and daytime population of those considered vulnerable to any impact on personal security. These amenities have not been listed individually due to the size of the assessment area for this appraisal, but include schools (over 25 within the personal security assessment area), nursing homes, community centres and parks and open spaces.

3.6.5. Appraisal of Security DIs – Step 3

This step uses the information gained in the previous two steps to undertake a full screening of the personal security impacts of the scheme.

Police crime maps[6] show that for July 2011 the northern part of the assessment area around Lockleaze and Frenchay had an average level of crime and anti-social behaviour compared with

[6] http://www.police.uk

the rest of England and Wales based on the number of crimes per 1000 people within the population area. The crimes were mainly anti-social behaviour and 'other crimes'

The southern end of the scheme had an above average level of crime for July 2011. The most common incidents reported within the area involve anti-social behaviour and 'other crimes' which include shoplifting, criminal damage and drug offences. It is likely that security issues are often linked to perceptions of poor security and a good design of stops, interchanges and passenger facilities is fundamental to improve the actual and perceived levels of security.

There is no information available regarding public transport users in the area but these are likely to be older and younger people and people without access to a car of which there are high concentrations throughout the scheme but mainly in the city centre area and towards the south of the scheme. The scheme proposes to have high quality facilities such as CCTV, real time passenger information, and high standard of lighting at the stops and the vehicles themselves will provide good levels of accessibility, security, information and comfort as they will be equipped with CCTV such that the driver can see CCTV images of all passenger areas.

Overall the assessment demonstrates a **moderate beneficial impact** on security across the impacted area as a result of the scheme. Whilst the proportion of certain groups in the security assessment area that have particular concerns about their personal security is higher than the local and national averages, well designed stops; additional buses; and improvements to links to bus stops will benefit users and local residents.

3.7. Accessibility Assessment

3.7.1. Introduction

Options will often have differentiated impacts on accessibility as experienced by different groups of people. This reflects a range of social and distributional factors including differences in travel needs and places of residence.

3.7.2. Confirmation of impact assessment area – Step 2a

For the initial screening a broad understanding of the areas on which the transport scheme was likely to have an impact was used. However for the full screening the assessment area:

- Identifies public transport corridors affected by a transport scheme; and
- Identifies key destinations served by these public transport corridors.

Accessibility improvements are likely to impact are more than those people living within close proximity to new services as interchange options provide links to other services across the area. Therefore the accessibility area includes the whole of the West of England Partnership area (encompassing City of Bristol, Bath and North East Somerset.

Some of the key destinations in the Bristol area have been used in the accessibility modelling to show the impact on journey times to these destinations from areas of Bristol. These destinations include:

- Bristol City Centre;
- Bristol Temple Meads Station;
- University of West England (Frenchay Campus);
- Cribbs Causeway;
- Bristol International Airport; and
- Bristol Parkway Station.

Accessibility modelling using Accession has been completed to assess the public transport journey time differences to any one of the listed destinations as a result of the proposed scheme. The analysis only present's journey time differences of greater than 5 minutes.

3.7.3. Identification of vulnerable groups in the area – Step 2b

There are certain groups that are particularly vulnerable to the effects of poor accessibility. These groups include no-car households, young people, older people, black and minority ethnic communities and people with disabilities.

Analysis has been undertaken to identify the concentration of the above groups within the West of England Partnership Area compared to the national figures as shown in Table 3-14.

Table 3-14 Proportions of vulnerable groups

Vulnerable Group	West of England Partnership Area	England
Children: aged <16	19.4%	20.1%
Older people: aged 70+	11.9%	11.5%
Disability Allowance Claimants	4.7%	5.3%
No Car Households	21.9%	26.8%
Women	51.1%	51.3%
Black and Minority Ethnic	9.0%	18.1%

Base: Population statistics for accessibility appraisal based on 2001 Census figures due to comparisons of outputs from Accession Model.

Table 3-14 demonstrates the proportions of vulnerable groups residing within the West of England Partnership area, which shows a slightly lower proportion of those with a disability, without access to a car and children under the age of 16 compared with national levels. However there are far fewer BME residents within the area compared with national figures.

3.7.4. Identification of amenities in the area – Step 2c

Identification of key amenities in the accessibility assessment area has not been completed in depth due to the geographic expanse of the area. The DI appraisal however considers accessibility to a number of key locations within the assessment area and therefore the wide range attractors that these key locations contain (including employment destinations, schools, retail centres, community centres, and health facilities to name a few). This DI appraisal therefore assumes presence of all vulnerable groups within the assessment, both in terms of travelling around the assessment area and also within the daytime population whilst visiting local amenities.

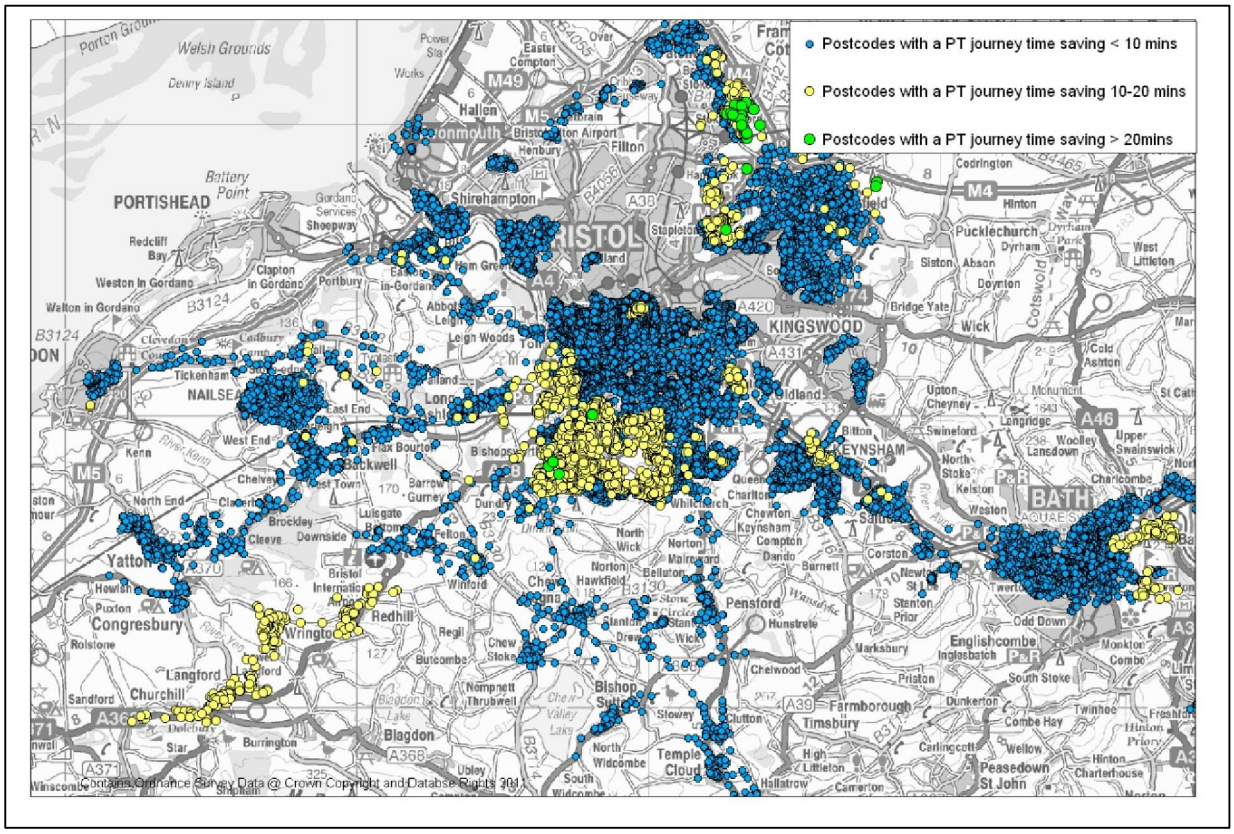
3.7.5. Appraisal of Accessibility Dis – Step 3

Accessibility modelling has been completed to assess the public transport journey time differences to any one of the identified destinations Cribbs Causeway, City Centre, Bristol International Airport, Bristol Temple Meads and Bristol Parkway rail stations and the University of West England, as a result of the proposed scheme.

The accessibility modelling demonstrates changes in public transport journey times to key destinations from a series of postcodes. A breakdown of the population living within these postcodes receiving savings in public transport journey times was undertaken to identify the

distribution of benefits across the vulnerable groups. Table 3-15 shows the breakdown of these groups and Figure 3-14 illustrates the postcode locations of residents receiving journey time improvements as a result of the scheme.

Figure 3-14 Postcodes points receiving journey time improvements as a result of NFHP



Nearly 425,000 (43.2%) of WoEP residents have access to a public transport service which improves their journey times to at least one of the identified destinations. The largest journey time savings occur on journeys to Bristol Temple Meads and Cribbs Causeway.

Table 3-15 illustrates that the scheme serves areas that have higher proportions of households without access to a car, those with a disability, BME and under 16 years of age than the West of England proportions and hence have been assessed to be moderately beneficial to these groups. Overall all vulnerable groups benefit from the scheme and hence the overall assessment is **moderate beneficial**.

Table 3-15 Accessibility analysis and appraisal by vulnerable group

	10 minutes+ journey time improvements	% of population	WOEP area	DI Appraisal
Children (<16)	15,824	21.5%	19.4%	✓✓
Older people (70+)	8,560	11.7%	11.9%	✓✓
People with a disability	4,610	6.3%	4.7%	✓✓
BME	4,897	6.7%	9.0%	✓✓
Women	37,863	51.5%	51.1%	✓✓

No Car Households	7,479	25.0%	21.9%	✓✓
Total Population	73,457	-	-	-

Population statistics based on 2001 Census figures due to development date of Accession model.

4. Summary of Findings

4.1. Appraisal Outputs

Table 4-1 presents a summary of the key distributional impacts for inclusion in the Appraisal Summary Table and Table 4-2 contains the DI appraisal matrix.

Table 4-1 Summary of Key Impacts

Assessed Indicator	Summary of Key Impacts	Seven Point Scale Assessment
Noise	Over 90% of receptors within the noise analysis experience no change as a result of the scheme. Slight beneficial impacts are experienced by those in income quintiles 2 and 4 as a higher proportion of receptors in these quintiles experience a decrease in noise than an increase. Income quintile 3 has a significant adverse impact as all properties within this quintile experience an increase in noise levels; however it should be noted that this only represents three receptors. Those in the most deprived income quintile experience no change as a result of the scheme. The overall DI appraisal for noise is **slight beneficial**, as the vast majority of the population do not experience any change in noise levels, and where there is a change, twice as many receptors experience a decrease in noise levels as an increase. Although there are concentrations of children in areas surrounding the scheme and resident in the receptors analysed, there are only a few areas where there is a deterioration in noise levels. In addition, the noise impact on a number of receptors used by children (schools, nurseries, children's health centres) has been assessed, and only a negligible impact has been identified. The DI appraisal therefore considers there to be a **neutral impact on children** as a result of the scheme.	Income deprivation - Slight beneficial Children - neutral
Air Quality	Air quality assessment identified only a negligible change in air quality in opening year as a result of NFHP and therefore no DI appraisal was required.	N/A
Accidents	The majority of roads within the transport model are expected to experience no change in accident rates as a result of the scheme. Where accident impacts are forecast, a higher number of links experience an increase in accident levels than a decrease. Analysis of the number of casualties on links experiencing a change in accident levels identifies that on average accidents involving vulnerable groups are just as likely to occur on links forecast for an increase in accident levels as those forecast a decrease in accident levels. There is some variation amongst vulnerable groups with slight adverse impacts noted for pedestrians, motorcyclists and those from the 20% least deprived areas nationally. Slight beneficial impacts were noted for cyclists, children and those from the 20% most deprived areas nationally.	Neutral

Assessed Indicator	Summary of Key Impacts	Seven Point Scale Assessment
	Overall the DI appraisal for accidents has been assessed as **neutral**.	
Security	The scheme proposes to have high quality facilities such as real time passenger information, high standard of lighting at the stops and CCTV at the stops and in the vehicles themselves. This will provide improved levels of personal security for users and in addition also provide improvements to accessibility and information which also helps alleviate fear of crime. Overall the assessment demonstrates a **moderate beneficial** impact on security across the assessment area as a result of the scheme. Whilst the proportion of vulnerable groups in the assessment area that have particular concerns about their personal security is higher than the local and national averages well designed stops; additional buses; and improvements to links to bus stops will benefit users and local residents.	Moderate Beneficial
Severance	A number of elements of the scheme design will assist in reducing actual and perceived severance for vulnerable users, such as pedestrian and cycle facilities, dedicated crossing points, at grade crossings and segregated footway and cycleways. This is an area which has concentrations of young people, a group which is susceptible to the impacts of severance. Overall, taking into account the rapid transit routes, pedestrian and cycle facilities, new crossing facilities and the new link road the scheme is considered to have a **moderate beneficial** effect on severance.	Moderate Beneficial
Accessibility	Around 40% of residents in the WoEP area will have improvements in public transport journey times to at least one of the key destinations examined as a result of the NFHP scheme. The largest journey time savings occur on journeys to Bristol Temple Meads and Cribbs Causeway. A larger than expected proportion of residents in each of the vulnerable groups for accessibility will experience journey time improvements to at least one key destination as a result of the NFHP scheme. As all groups experience some benefit as a result of the scheme, the DI appraisal is considered to be **moderate beneficial.**	Moderate Beneficial
Affordability	No assessment required	N/A
User Benefits	Overall there are net benefits for all income quintiles. The value of benefits favours those in the least deprived income quintiles, but the most deprived income quintiles experience benefits in line with what may be expected from a fair distribution. The DI appraisal is therefore considered to be **moderate beneficial.**	Moderate Beneficial

Table 4-2 Distributional Impact appraisal Matrix – Step 3

	Distributional impact of income deprivation					Are the impacts distributed evenly?	Key impacts - Qualitative statements
	0-20%	20-40%	40-60%	60-80%	80-100%		
User benefits	✓✓	✓✓	✓	✓✓	✓✓✓	No	Overall there are net benefits for all income quintiles. The value of benefits favours those in the least deprived income quintiles, but the most deprived income quintiles experience benefits in line with what may be expected from a fair distribution. The DI appraisal is therefore considered to be **moderate beneficial.**
Noise	0	✓	xxx	✓	x	No	Over 90% of receptors within the noise analysis experience no change as a result of the scheme. Slight beneficial impacts are experienced by those in income quintiles 2 and 4 as a higher proportion of receptors in these quintiles experience a decrease in noise than an increase. Income quintile 3 has a significant adverse impact as all properties within this quintile experience an increase in noise levels; however it should be noted that this only represents three receptors. Those in the most deprived income quintile experience no change as a result of the scheme. The overall DI appraisal for noise is **slight beneficial**, as the vast majority of the population do not experience any change in noise levels, and where there is a change, twice as many receptors experience a decrease in noise levels as an increase.
Air quality	N/A	N/A	N/A	N/A	N/A	N/A	Scoped out of appraisal
Affordability	N/A	N/A	N/A	N/A	N/A	N/A	Scoped out of appraisal

AST entry											
	Social groups						**User groups**				**Qualitative statement (including any impact on residential population AND identified amenities)**
Impact	**Children & young people**	**Older people**	**Carers**	**Women**	**Disabled**	**BME**	**Pedestrians**	**Cyclists**	**Motor-cyclists**	**Young male drivers**	
Noise	0										Although there are concentrations of children in areas surrounding the

											scheme and resident in the receptors analysed, there are only a few areas where there is a deterioration in noise levels. In addition, the noise impact on a number of receptors used by children (schools, nurseries, children's health centres) has been assessed, and only a negligible impact has been identified. The DI appraisal therefore considers there to be a **neutral impact on children** as a result of the scheme.
Air Quality	N/A										Scoped out of appraisal
Accidents	✓	0					×	✓	×	0	The majority of roads within the transport model are expected to experience no change in accident rates as a result of the scheme. Where accident impacts are forecast, a higher number of links experience an increase in accident levels than a decrease. Analysis of the number of casualties on links experiencing a change in accident levels identifies that on average accidents involving vulnerable groups are just as likely to occur on links forecast for an increase in accident levels as those forecast a decrease in accident levels. There is some variation amongst vulnerable groups with slight adverse impacts noted for pedestrians, motorcyclists and those from the 20% least deprived areas nationally. Slight beneficial impacts were noted for cyclists, children and those from the 20% most deprived areas nationally. Overall the DI appraisal for accidents has been assessed as **neutral**.

Personal Security	✓✓	✓✓		✓✓							Overall the assessment demonstrates a **moderate beneficial** impact on security across the assessment area as a result of the scheme. Whilst the proportion of vulnerable groups in the assessment area that have particular concerns about their personal security is higher than the local and national averages well designed stops; additional buses; and improvements to links to bus stops will benefit users and local residents.
Severance	✓✓	✓✓	✓✓		✓✓						A number of elements of the scheme design will assist in reducing actual and perceived severance for vulnerable users, such as pedestrian and cycle facilities, dedicated crossing points, at grade crossings and segregated footway and cycleways. This is an area which has concentrations of young people, a group which is susceptible to the impacts of severance. Overall, taking into account the rapid transit routes, pedestrian and cycle facilities, new crossing facilities and the new link road the scheme is considered to have a **moderate beneficial** effect on severance.
Accessibility	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓					Around 40% of residents in the WoEP area will have improvements in public transport journey times to at least one of the key destinations examined as a result of the NFHP scheme. The largest journey time savings occur on journeys to Bristol Temple Meads and Cribbs Causeway.

											A larger than expected proportion of residents in each of the vulnerable groups for accessibility will experience journey time improvements to at least one key destination as a result of the NFHP scheme. As all groups experience some benefit as a result of the scheme, the DI appraisal is considered to be **moderate beneficial.**

Key: ✓✓✓ = Large Beneficial
✓✓ = Moderate Beneficial
✓ = Slight Beneficial
0 = Neutral
× = Slight Adverse
×× = Moderate Adverse
××× = Large Adverse